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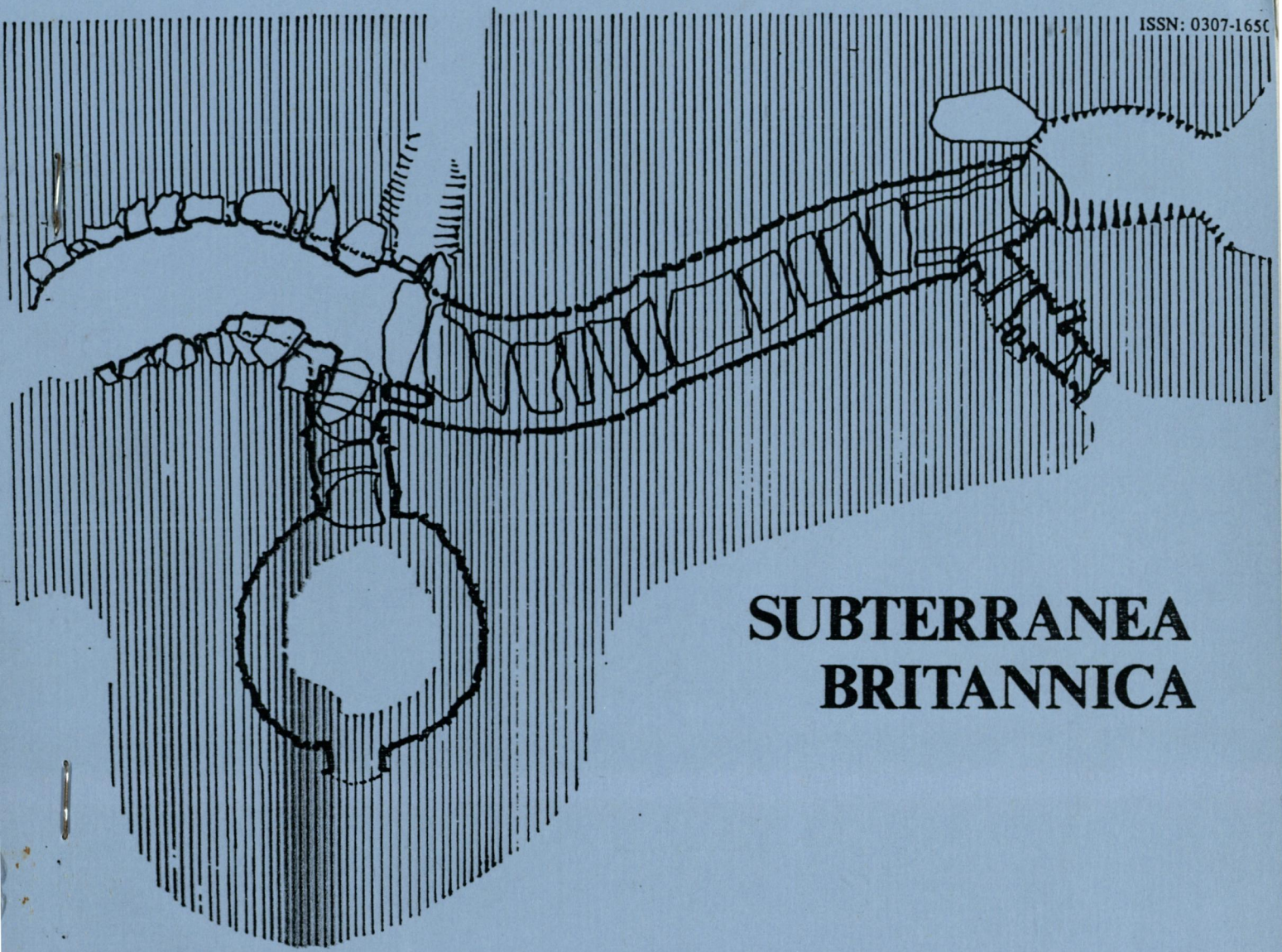

SUBTERRANEA BRITANNICA

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THE BULLETIN OF SUBTERRANEA BRITANNICA

No 21 - January 1985

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This Bulletin is the official publication of Subterranea Britannica.

Subterranea Britannica is associated with Societe Francaise d'Etude des Souterrains of France, Arbeitskreis fur Erdstallforschung of Germany, and SOBERES of Belgium.

The Bulletin has been compiled by Sylvia P. Beamon with assistance from Rod Le Gear, Deryck Laming, Jenny Plumer and Paul Sowan.

REPORT ON THE A.G.M. AND DAY CONFERENCE
Lucy Cavendish College, Cambridge, 20th October 1984

Malcolm Tadd

The chief events of interest at the 1984 Annual General Meeting, which marked the tenth anniversary of Subterranea Britannica, were the radical changes in the composition of the Committee. Fortunately for the new Committee, Sylvia Beamon, whose name is virtually synonymous with Subterranea Britannica, still continues to edit the Bulletin as an ex-officio Committee Member.

Thanks were accorded to Sylvia for her previous work as Chairman and also to Lena Clark and Anne Smith who had both served on the old Committee.

A very full day of talks and slide presentations followed and during the lunch interval it was pointed out that the nearby Cambridge Folk Museum could be visited.

Peter Bancroft's talk was entitled Tubes in War Time and covered the use of the London Underground stations as air-raid shelters both in World War I and World War II. It is probably news to most people that extremely large numbers of people sheltered during the Zeppelin raids on the London docks in World War I.

During World War II much thought, but comparatively little practical action, was taken over the possibility that the bombing might pierce the tunnels under the Thames and consequently cause much flooding in the tube system.

Peter Bancroft related the wartime usages of the tubes to the historic growth and modifications of the total underground railway system in a very interesting manner. Slides to demonstrate almost all the points were shown, a sheet of references was given to everyone in the audience and the author had several books, pamphlets and maps for sale.

Dr Derek Renn is an authority on mediaeval castles and believes in involving his audience while giving talks. He was not disappointed, for this particular talk on Underground Defence - Mediaeval Passages stimulated much lively discussion and conjecture.

There are very few tunnels associated with mediaeval castles and even when they have been found their purposes are seldom understood. However, some known tunnels could have been dug for undermining in assaults on the castles or for counter-mining in defence. An example of this occurs at St Andrews, Scotland where both types of tunnel can be viewed to this day.

It was the very lack of evidence and information that made Dr Renn's subject especially intriguing. Superb drawings and plans displayed by an overhead projector added to the general captivating nature of this talk.

Peter Burgess described, very authoritatively, the techniques of Surveying the Chaldon Bottom Mine at Merstham, Surrey. He is personally very much involved in this work for which Subterranea Britannica has been awarded two archaeological grants by Lloyds Bank. This is a work of excellence, as yet unfinished, but Peter was at pains to point out that the initiation and mastermind behind the whole project was Chris Bayley of Unit 2 Cave Research and Exploration.

Roger Morgan gave a very unusual talk entitled Hides of the British Resistance. Had the Wehrmacht gained a foothold on southern England during World War II, there were plans for a British resistance movement to operate behind their lines. These involved a series of hidey-holes, the entrances of which were concealed with hinged tree trunks, hinged cattle troughs and the like. At this distance in time these comic-paper ideas introduced a little hilarity into the proceedings.

Also described were underground wireless posts manned by women of the Auxiliary Territorial Service (ATS) which, if found by the enemy, concealed a hidden second

chamber from which the girls could valiantly continue radioing despite the Germans being the other side of the wall. Eventually the girls could escape by crawling through a small pipe which led to the ground above.

Since Roger gave this talk it seems that a programme appeared on Southern TV covering the same subject. Did any Subterranea Britannica members see it? Even better, has anyone made a video recording?

Martin Black described and presented slides about his time spent in Canada and the U.S.A. In Vancouver he visited a disused copper mine now fitted out as a museum for tourists.

However, Seattle on the Pacific coast offered a quite unusual underground experience. With the advent of the water closet last century, this great lumber town ran into a sewage disposal problem since the town itself was at sea-level and effective drainage into the sea became impossible. The solution was to raise the level of the town roads, but not the levels of the sidewalks adjoining them. Thus it was that the sidewalks and the former shop fronts disappeared underground but tney were not buried - merely roofed over to bequeath a source of fascination for the tourists of today.

Martin spiced up his talk with interesting anecdotes. For example, to finance the new sewage system, the city administrators of the last century conducted a census to find out which was the city's most popular means of livelihood, with a view to taxing it. It turned out that seamstresses predominated in the city and therefore a tax was put on sewing machines. Alas for the tidy minds of organisers - no sewing machines were sold since in this rough frontier town seamstress was a euphemism for prostitute.

Again, lumber reached the town by sliding down a track which eventually became the rough quarter of the town. This track was known as Skid Road (Row) which has now entered the language as synonymous with degradation and destitution.

Matthew Freeman, aged 13 years, gave the final talk of the afternoon entitled Tunnels under Hitchin. This was billed as a short communication, but was worthy of a full talk. With ample slides he showed how a complex system of tunnels emanating from a former Carmelite nunnery still exists hidden under Hitchin. This quite inspiring talk maintained and concluded the high standard of the day's presentations and left at least this writer hoping that one day Matthew will show him around Hitchin.

A SUMMARY OF GREEK AND ROMAN MINING

J.F. Healy

The Greeks mined argentiferous galena at Thorikos (Attica), certainly from the early Bronze Age. Subsequently all techniques including pitting, placer-mining, simple adits, open-cast and deep-vein extraction, were used throughout the Greek world. The geological conditions of Southern Attica (Laurion) meant that galleries, of small cross-section, did not need elaborate shoring and, because workings were generally not below sea-level, drainage problems were obviated. Ventilation, however, was always difficult. Some 2,000 shafts were sunk at Laurion, the main period of exploitation being in the 5th Century B.C. Mining tools once designed were subsequently little modified.

Roman mines, especially in Spain, were deeper and their galleries, often on different levels, subject to flooding. Engineers drained the mines by ascending pairs of drainage-wheels leading to the surface. Conditions for slaves, P.O.W.s and Christians forced to work in the mines were appalling: by the late 2nd century A.D. their replacement by free-labour led to improvements, as the Aljustrel Tables indicate.

Reference: HEALY, J.F. (1978), Mining and Metallurgy in the Greek and Roman World: Thames and Hudson, London.

STOP PRESS - A NEW UNDERGROUND DISCOVERY IN SURREY

Bruce Osborne

News is coming in of an unusual find in Surrey. Subterranea Britannica members recently had the opportunity of inspecting the new site at Tadworth, now being excavated by members in conjunction with local archaeologists.

For some years subsidence was apparent in the vicinity of the old water tower (declared redundant in 1919). Being on private land, only lately were trial exploratory digs initiated, revealing a curiously domed underground brick structure.

Further exploration and excavation is now required, hopefully leading to conclusive identification of the structure.

On inspecting the entrance chamber, Malcolm Tadd considered it possibly an ice well. Sylvia Beamon, co-author of the forthcoming book on ice houses is to be consulted. The basis of this identification is the nature of the brickwork and its similarity to known ice wells.

Local legend mentions subterranean passages to Tadworth Court, approximately a quarter of a mile away (Clew, 1971). One possibility is that the new discovery is part of a labyrinth of underground "monks' ways". Alternatively, it may be associated with the development of the immediate area by the Sutton District Water Company in the 1890s. It is also questioned as to whether it could be the original well-head supplying the water tower now converted to domestic residential use.

Paul Sowan also reviewed the site recently, and one further speculation is that it may be another underground malt kiln as recently identified by Subterranea Britannica members at Margate. Advice is to be sought from Nottingham members who have done considerable work on underground malt kilns.

The most controversial identification (so far) comes from local historian B. Robeson who believes it to be a rare mediaeval purging pit.

It is hoped to solicit the services of a Subterranea Britannica/Unit 2 survey team following further excavation. Members will possibly be able to inspect the site on the next Surrey Study Weekend. At the moment the site is on private land with restricted access.

In the next bulletin, it is hoped to bring more news with pictures and a survey plan of this fascinating find. Any members wishing to participate on the dig should contact the author.

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DATE FOR YOUR DIARY

Autumn Day Conference and Annual General Meeting at "Strathaird", Lucy Cavendish College, Cambridge on Saturday 19th October 1985.

PREHISTORIC REFRIGERATION?
THE EXAMINATION OF CERTAIN PITS WITH NO OBVIOUS FUNCTIONAL USE

Paper Presented at the Societe Francaise d'Etude des Souterrains Symposium in conjunction with Der Arbeitskreis fur Erdstallforschung - July 1980

Sylvia P. Beamon

I prepared a Dissertation entitled The Utilisation by Man of Cold Elements: Frost, Snow and Ice towards my degree in Archaeology and Anthropology in June, 1977. I attempted to review the ways in which snow, ice, frost and even low temperatures produced by natural means have been utilised by man. By the very nature of the materials used, the evidence is often circumstantial, because when ice melts it leaves no trace in the archaeological record.

In particular I would like to explore the question as to whether when climatic conditions allowed, any of the pits found on prehistoric sites could have had the function of:

1. The storage of snow and ice for use in the summer months, for the cooling of beverages, etc?
2. The short term preservation of food, e.g. dairy products, meat and oysters by packing items around with snow?

The reason I became interested in the possibilty of the early preservation of ice and the likelihood of keeping food by refrigeration was through my study of the construction and use of ice-houses of comparatively modern times, which was simple but effective (1).

The knowledge of the ice-house was supposed to have been introduced into England in 1660 by Rose, the gardener to King Charles II, after a visit to Versailles, France; but I question the assumption that this was the first time ice was preserved in this country? The Romans had their ice-houses, stored oysters in ice-cellars and cooled wine with ice in the summer months (2). The Britons imported wine and the accoutrements that went with it. Did they also import the idea of storing ice in the winter for the same purpose of cooling their drinks during the summer? Or did they already have this knowledge? From very early times, man must have been aware that if a bird fell dead from the sky at the onset of a fall of snow or severe frost, it was still edible at the thaw. What is more natural than to try and utilise this knowledge to store dairy food, meat and oysters?

One of the main points I raise is that, on Iron Age sites, there is often a surfeit of pits and it would be interesting to conjecture whether any of them could have been used as ice pits.

In 1978 I sent the latter part of my Dissertation dealing with prehistoric pits to Dr Peter Reynolds, Director of the Butser Ancient Farm Project at East Meon, Petersfield, Hants. I was invited down to discuss the matter in November, when he offered every assistance and decided I could be allocated two pits for experimental use.

Before giving a brief outline of the first experiment, it is prudent to consider the construction of an ice-pit, how it was filled, together with several ethnographic examples.

Boyle, writing in 1665 and quoting Evelyn, the Diarist, stated "That to condense snow, they laid clean straw on the grate at the bottom of an ice pit, and then beat the snow to a hard cake to one foot [30 cm] thick. They then laid straw and snow alternately, till the pit was full. Finally, straw or reed was put overall, and the doors kept shut, and some preserved a circle of trees above the pit" (3).

Ice-houses were constructed in a variety of forms, domed or globe-shaped, circular or rectangular chambers and, more rarely, tunnel and bell-shaped. Possibly the most convenient shape was egg or pear shape with the narrow end pointing downwards, so that

when filled with ice any contraction would ensure that it compacted into the reduced area below still ensuring maximum insulation (4).

There are three basic principles for storing ice in a pit or ice-house:

1. Dryness of the interior;
2. Efficient insulation to exclude the influence of temperature changes and humidity externally;
3. Drainage from below of the meltings, except in chalk, sand or gravel stratas where natural drainage occurs.

I tried to establish tne earliest references for the storage of snow, ice or frost worldwide. In China ice was harvested and stored before the first millenia B.C. as recorded in Book 15 of the Songs of Pin (5). From the I-Li, written before 550 B.C., ice was used in ritual bathing of corpses before burial (6). In India (185) pits were filled with ice formed in small porous pottery dishes overnight, yet the temperatures never drop below 11°F degrees above freezing point. Double pits are known here, one for the storage of the ice and the other lower pit to collect the meltings (7). The collection and storage of ice, its properties, were well-known in the East as well: they had fields of ice, ice-pits and ice-houses. There are traces all over the Mediterranean and Black Sea regions. In Syria the snow of the Lebanon is still collected and stored in pits and cellars. It is not known exactly how old this custom is, but there is definite information about a 'cold-house' (bit-halpi) in the city of Ur during the reign of Shulgi (c. 2000 B.C.) (8).

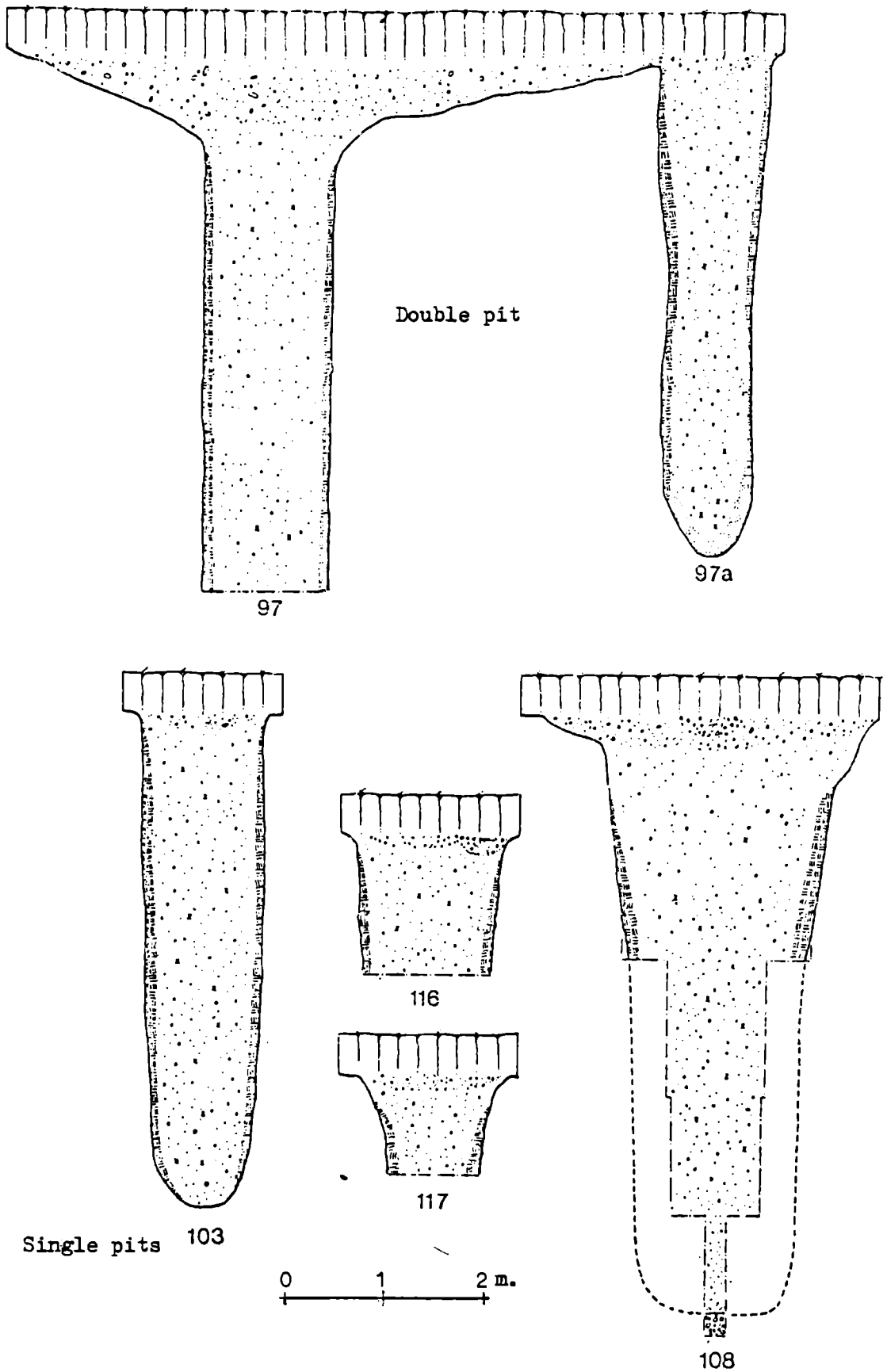
In Iran the actual date of the first ice-house is unknown; however, records show that by 1450 A.D. in the central plateau, the use of ice-houses was extensive. There are ice pits near Teheran (Yakghtal). Water was divided into the shallow zig-zag trenches every day during the winter and allowed to freeze overnight. The ice, formed by next morning, was then raked into long deep pits shaded by high mud-brick walls. When each pit was full, the ice was covered with straw and kept for use in the summer. Refrigeration technology came into use slowly in Iran and it is only in the last decade that they have caught up with the West, and their huge ice-houses are decaying (9).

The South American Indians freeze-dried potatoes by using the frost (10). Some Eskimos kept meat in high meat-stands built of snow, or like the Nunmamuit people of North Alaska today, kept chunks of Caribou meat in a permafrost cellar. Throughout the region of Western Alaska berries were collected and packed in birch-bark baskets, so also was salmon roe. These commodities were then stored in a permafrost underground cache (11).

Cold Setine, diluted with snow-water, was a common form of refreshment in summer for the Greeks (12). Snow was sold in Athens from the 5th Century B.C. The oldest 'psycter' known of the 6th Century B.C. is a double-walled amphorae with an opening at the neck between the two surfaces to accommodate snow-water or hot water according to the season to vary the temperature of the wine in the interior of the vessel. The water could be drained off through a small opening at the bottom (13).

There is no doubt that the use of ice was long familiar to the Greeks and Romans. When Alexander the Great, King of Macedonia, besieged the town of Petra in Jordan, c. 327 B.C., he is reported to have ordered 30 refrigerating pits to be dug. A similar enterprise was noted by Plutarch (14).

The Romans collected snow from the mountains and harvested it in the same mode as the Greeks. Snow was an important article of merchandise, sold in shops and hawked around Rome. It was used in some of their culinary dishes, and as mentioned before they stored oysters in ice-cellars. Ice was also used for cooling pools in some of their baths (frigidaria) (15).



The hatching at the sides of these Neolithic pits represents a clay lining. This lining seems to peter out towards the base in some cases (see pit 103) leaving a natural draining gravel bottom.

Prehistory: The pits to come under discussion in this section are not considered to be suitable as grain pits; several have been classified as being for ritual purposes, however, the Palaeolithic examples do not apply.

Palaeolithic: Professor McBurney of Cambridge University informed me that at La Cotte St Brelade, Jersey, a transition site from Acheulian to Mousterian culture, he had found evidence in pits of the storage of large fragments of elephant and rhinocerus, which he presumed had been frozen in the permafrost of c. 140,000 years ago (Rissian age). He considered this to be the earliest evidence of food storage anywhere.

From Kostenki-Borshevo in the Ukraine, it is considered these sites belong to the Wurm glacial period (c. 25,000 B.C.) which includes the cold maximum of the last glaciation, and that some pits were caches or storage pits as they contained accumulations of mammoth bones believed to be remnants of meat and fuel reserves. Presumably, here again permafrost conditions aided the preservation of food (16).

Neolithic: At Eaton Heath, Norwich, there is a series of shafts dated by sherds to the Neolithic (c. 2,500 B.C.) period. The shafts had been dug into soft sands and gravels, and the deeper ones provided with a clay lining up to 15 cm thick (except in the base itself which would have meant drainage could have occurred). In general the fill consisted of soft brown sandy soil which contained variable amounts of charcoal and occasionally included darker lenses of more loamy material. In those shafts where the bottom was reached, there was not one instance of a basal deposit, nor any indication of their purpose (17). Some were double pits of varying depths and other double pits are seen at Great Chesterford (Romano/British) (18). It should be noted here again that double ice-pits are known from India of the 19th Century.

Bronze Age: I would like to offer at this stage an alternative explanation to that offered by Prof Piggott for the Bronze Age Pit at Swanwick, Hampshire, which he investigated and described as a ritual pit and compared it with a similar structure in Holzhausen, Germany. I suggest the central post was to support either a trestle or basketry infill, so that any melting ice could be retained at the bottom to prevent dissolution of the mass, for in this case natural drainage would not have taken place (clay soil), as it will when pits are in calcareous or gravel soils (19).

Iron Age: Frequently on Iron Age sites there appears to be surfeit of pits in proportion to the size of settlement. Gerhard Bersu (1940) discussed the large number of pits of varying sizes found at Little Woodbury and their possible function. He rejected the view as expressed by some, that such pits have been planned on purpose to bury rubbish, because a whole number of pits have been filled not with rubbish but with pure chalk and cultivation soil. No one will take the trouble to spend considerable labour in digging deep cavities only to fill them up again with the material thus extracted (unless it could be argued that the winter months did not produce the expected freezing conditions to fill them with snow or ice). He suggested the pits were stores for a variety of products, not just for grain.

Romano-British: From my point of view, one of the most interesting accounts is a record from 1870 of two pits found at Ashill in Norfolk, both shafts having been boarded. Steening, another word for boarding, was used for ice-pits in the 17th Century as mentioned by Boyle (1665) when referring to Italian snow pits. The first shaft was 40 feet (12.2 m) deep and the second one 22 feet (6.7 m) deep; both were 3 feet 6 inches (1.07 m) square. The contents of the first shaft were miscellaneous for the upper section, which could be attributed to back-fill, but at 19 feet (5.8 m) urns were found to be placed in a symmetrical manner and continuing to be thus placed down to the bottom. At 24 and 26 feet (7.3 m and 7.9 m), urns symmetrically placed as before, the lower layers were bedded in oak and hazel leaves. (Note: oaken boughs covered the ice pits at Petra, and prunings, leather, sawdust and straw were all used for insulation). At 30 feet (9.1 m) urns as before, a boar's tusk, pieces of sawn deer's horn. At 32 feet (9.7 m) another layer of urns with leaves and large stones over them. Lower still was part of a quern stone, small stone pounder (snow had to be

pounded)... At 34 feet (10.34 m) urns; over them stones, which showed traces of fire. Some of the urns had bands of sedge round them as if to lower them by, some were cased in basket work, and others had string with slip knots. At 40 feet (12.2 m) the haunch bone of a deer was found, and the bottom of the shaft was reached. It consisted of flints (for drainage?). The woodwork of the shaft here was maintained in place by four willow stakes... (21).

Some of the items from this site were preserved in the collection of the late T. Barton and amongst them, not originally listed, was a small saw with a long round handle. Saws with long handles were common to the ice industry of comparatively modern times.

Preliminary Experiment into the Preservation of Ice at the Iron-Age Experimental Site (Butser Ancient Farm Project Trust) East Meon, Petersfield, Hampshire

Before embarking on the actual experiment, Dr Peter Reynolds and I discussed the actual shape of pits to be used. In my opinion, the pits most likely to have been used for ice storage probably had a small sump in the base to facilitate drainage; however, after due consideration, we decided to use the pits available with flat bottoms for the first basic experiments. As the subsoil is chalk, it is possible that the necessary drainage would take place. At a later stage it will probably be a useful undertaking to create a specific pit based on one from a known Iron Age site, for example, Pit No. 24 from the Wandlebury, Cambridge, site which has a sump (22).

On 4th February 1979, the Little Butser pit (2.2 m deep and 1.25 m in diameter) was filled with snow and layered with barley straw. The snow was in a state of neve and was packed down by stamping with clean boots. The bottom 45 cm was of straw, then six alternate layers of snow and straw and finally covered with 25 cm of turf and earth as insulation. Thermistors were placed in the snow layers rather than in the straw layers as, although there was a risk of their becoming ice-bound, there were doubts about the insulating properties of the straw. All the snow may have melted but still preserved the inner structure and continued to achieve comfortably low temperatures.

Regular temperature readings were taken and the pit collapsed five weeks later, when we experienced a particularly warm spell of weather for the time of year. This is a small pit and the snow had lasted longer than Dr Reynolds had expected, particularly as the pit had not been covered with a thatched cone to prevent rain from seeping in.

No experiment was carried out in the winter of 1979/80 as no snow fell in England.

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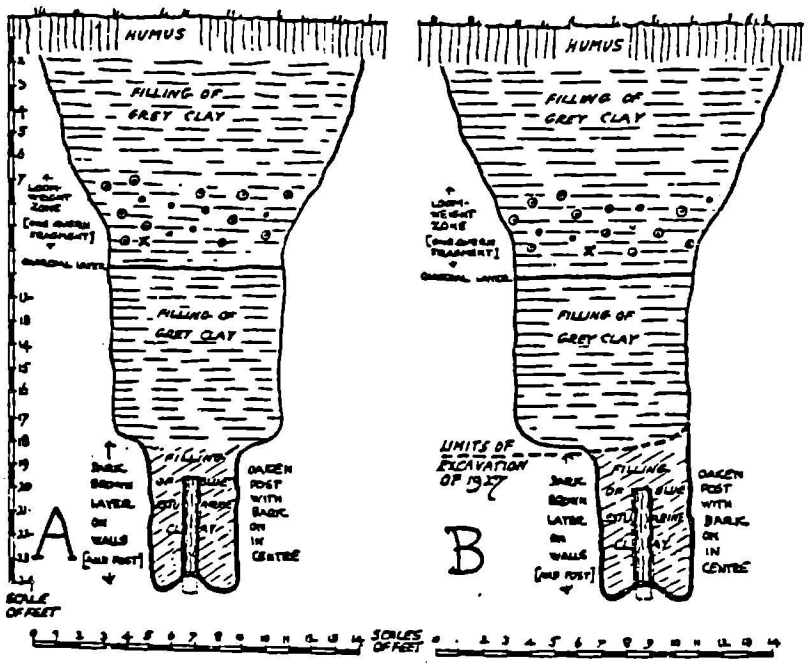
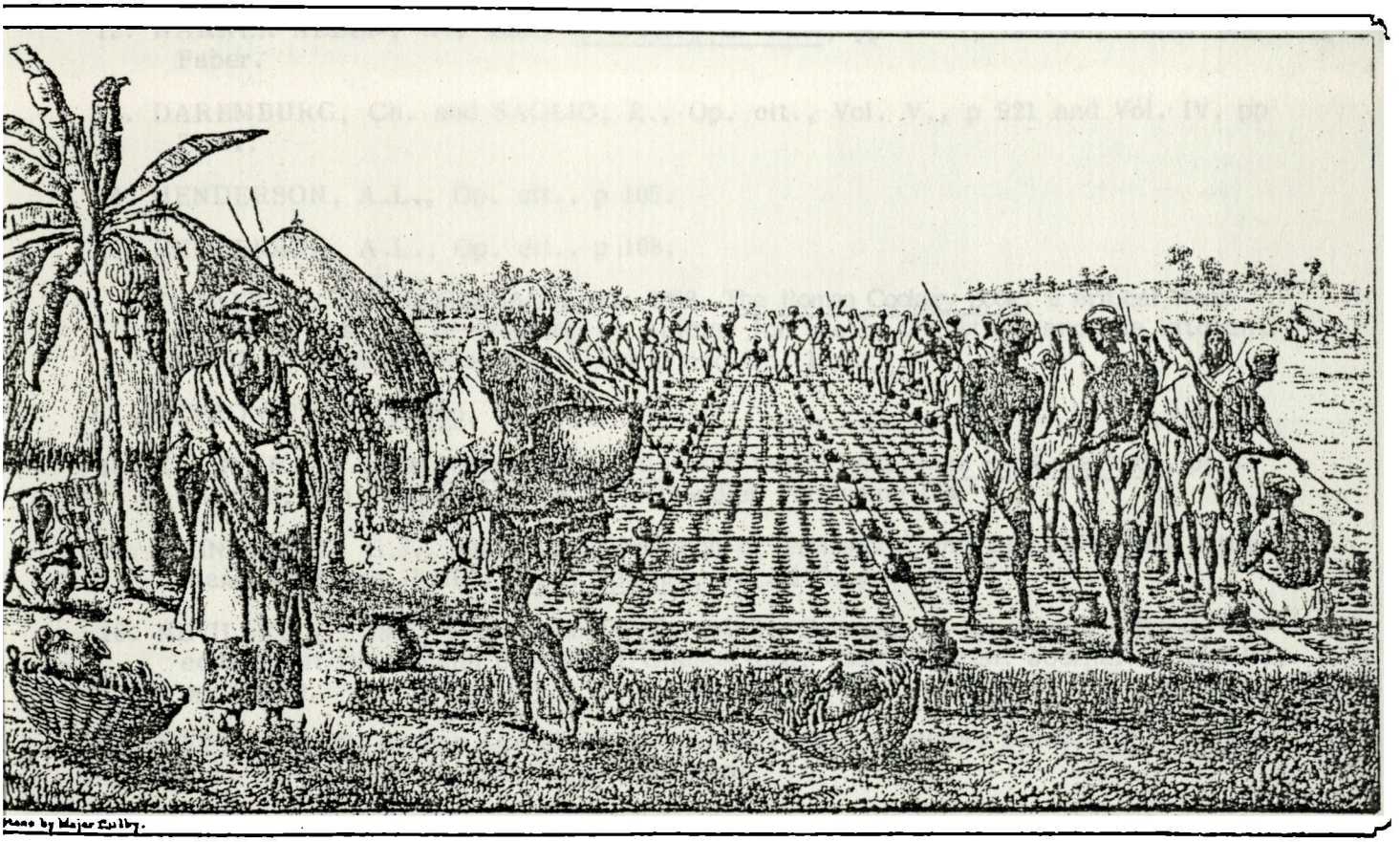
Bronze Age pit at Swanwick, Hants. This pit dug in clay, containing a sump, had been given a lining which peeled off when exposed to the sun during excavation by Fox in 1928.



Two sections of the pit: A parallel to the working face of the clay-pits; B at right angles thereto.



Indian Ice Pits. The men are filling small porous dishes with water to freeze when the temperatures drop. When frozen in the night, the small pieces of ice were collected in baskets and taken to the adjacent pits for storage. The illustration is from F. Parks - Wanderings of a Pilgrim in search of the Picturesque... Vol: I (1850).

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BOOKS OF INTEREST

Military Tunnelling - Hector Straith, 1833
Croydon: printed and published by William Annan, High Street, xxviii + 411 pp.

A treatise on fortification, deduced from established principles, with observations on the increased effects of artillery; compiled by... assistant in the fortification department and instructor in practical engineering and artillery, at the Hon. East India Company's Seminary, Addiscombe.

[Includes details of construction of casemates, countermines, listening galleries, and so forth].

Copy in C.N.H.S.S. Members' Library.

P.W.S.

Van Schaik's 'Sint Pietersberg' revised and republished

Sint Pietersberg is the 'mountain' lying across the Dutch/Belgian border immediately to the south of the Dutch town of Maastricht. The hill is of intense interest for its natural history (this and other eminences in this southern, hilly, part of the Netherlands, offering habitats not found elsewhere in the country), its geology (Mosasaurus was found here) and not least from its extraordinarily large and extensive subterranean building-stone quarries, described in Bull. Sub. Brit. Nos. 12 and 13.

D.C. van Schaik wrote the definitive work, long out of print, for the area in 1938. His book has now been updated to 1983 and reissued with extensive additions. In Dutch, but much of the technical material is not too hard to follow, the new edition is issued by E.F. and E.F. b.v., Thorn (ISBN 90 6177 451 9) and has 566 pp, illustrations and two folding maps. Cost about £20.00.

P.W.S.

A.J. Forrest: Masters of Flint.
Lavenham: Terence Dalton Ltd, 1983 - £7.95 (hardback; softback version also available) x + 134 pp including illustrations (ISBN 0 86138 0150).

The author has been a resident of Brandon since 1948, and has chronicled in particular detail the last days of the flint-knapping industry of that place, as well as attempting a more general historical survey of the industry from the mining of the flint through to the distribution of the products, knapped flint in East Anglian buildings or gunflints throughout the world. He has evidently consulted all the right persons and sources, and it would appear that the book will be of particular value for its coverage of the last century of the industry.

P.W.S.

Felix James Samuely and Conrad Wilson Hamann, 1939: Civil Protection: the application of the Civil Defence Act and other Government requirements for air raid shelters, etc

London & Cheam: The Architectural Press (iv) + 168 pp, xxxii pp adverts

Abstracts of the Air-Raid Precautions Act, 1937, and of the Civil Defence Act, 1939, and an analysis and explanation of the Government's standards for the protection of civilians as required by those Acts act... detailed suggestions, with drawings, for all kinds of shelters including underground shelters 'should be of great value to all architects, engineers, surveyors and builders who may be commissioned to design or construct air raid precaution works'. Although 'deep shelters' are included, it seems there are details only for 'cut and cover' designs and not for rock-cut, tunnelled, or conversions of pre-existing cavities.

P.W.S.

Railway Contractors Series, of A Gazetteer of the Railway Contractors and Engineers of the West Country 1830-1914, Book 2, by Lawrence Popplewell.

Melledgen Press, Ferndown, Dorset, 44 pp plus 8 maps and illustrations.

Following the very considerable continuing success of the first book in this specialist series, the intended June publication is announced of the second gazetteer: of railway contractors and engineers for the West Country, which - due to the considerable interest and demand generated - has had its intended publication date advanced.

Again, therefore, this unique work - like its predecessor - gives comprehensive new details concerning the builders of all the various railways which were brought into use in the West Country (i.e. Southwest of the Bristol/Gloucester-Poole axis) before 1914, together with each component link's opening date for public passenger traffic (plus relevant source data). In a number of cases also, full details are given similarly of the various successful and unsuccessful tenders made by these little known Victorian entrepreneurs, thus giving greater depth to the whole.

So, altogether, this publication provides a further important coverage of the railway builders of a significant English region (and particularly too of the ports of Plymouth and Bristol) whilst filling a vital gap in present knowledge - not least for these elusive figures' key roles in the human explanation of the problem of Victorian railway alignment - which subject is now an important research field. Thus, for all these reasons - and not least the elucidation of the general transport historical environment - this new gazetteer again is a pioneering and trendsetting work which, limited first edition, is being offered here, initially. So - to avoid delay - be sure to order your copy now (see below) to take advantage of this rare and very collectable offer.

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Published by: The Mining Research Group, Department of Economic History, University of Exeter, in association with the Northern Mine Research Society and the Peak District Mines Historical Society.

Orders to Dr R. Burt, Department of Economic History, University of Exeter, Amory Building, Exeter, Devon.

SOURCES FOR QUARRY HISTORY:
G.F. Harris' notes on Stone Quarries

Paul W. Sowan

G.F. Harris toured England extensively during the 1880s and 1890s, visiting most of the important stone-quarrying areas and making copious notes of his observations. Some information based on his visits was published during 1886 in two series of articles in The Builder, one on 'Our Building Stones I-XVI' (The Builder 13 March 1886 - 26 June 1886), the other on 'Stone Quarries I-XXVI' (The Builder 3 July 1886 - 25 December 1886). But much detail and many quarry descriptions were not published and are preserved only in a set of four manuscript notebooks now held in the Library of the British Geological Survey in London - (archival collections, ref. I 1/970). When I inspected these notebooks, which constitute a most valuable source of information on numerous subterranean stone quarries and a few miscellaneous workings, notebook 1 was temporarily on loan to the Survey's Aberystwyth office (so presumably contains a substantial, if not predominant, Welsh content); but the following account of the contents of notebooks 2-4 may be of interest to others:

Book 2 - notes made in 1893

Book 3 - notes made in 1893-94

Book 4 - notes made in 1892-1894

The fourth notebook contains descriptions of the stone samples collected throughout Harris' excursions, results of tests and measurements carried out on them, and so forth. Each sample is carefully identified and located in the main text.

Not all the quarries visited were subterranean, of course (those at Portland appear always to have been openworks, for example), but many of them were. The notes contain a wealth of sketch-maps, sketches of quarry layouts and of tools, geological sections measured at the working faces, and so forth. To a small extent Harris quoted basic data from the published official lists, but most of the information recorded is from first-hand observation, discussion with quarry foremen, etc. The nature of the entries may be judged from those for Tisbury (Wiltshire) and Godstone (Surrey):

Tisbury, 13 September 1893

(1) T.P. Lilly has 3 quarries at Chilmark (2 underground, 1 open); 1 at Wardour; and 1 above Tisbury station (Chantrey Quarry). He employs 11 quarrymen and 14 masons etc.
(2) Levi Bowles, 1 quarry at Chilmark, employs 3 men - called Chilmark stone - open working.
(3) Henry Leaver, 1 quarry in Tisbury, employs 6 men - called Tisbury stone.

... walked a long way [from Tisbury station] over some Downs until we came to a pretty ravine in which is situated...

Quarry No. 73... called Chilmark quarry. Worked by T.P. Lilly who here employs 7 men underground getting stone. Only the Pinney Beds are worked here.

[A sketch section appears, shewing 4 ft 1 in of 'Hard Pinney Bed - hardest in the middle' occupying the lowest part of the working face, above which were the 'Soft Pinney' or 'Top Pinney' bed (3 ft 1 in), the 'Green Bed - sometimes tight' (1 ft 2 ins) and the 'ceiling most excellent'].

There are 4 workings; the above details were taken in one of them. The 'Green Bed' shown on top is not always present. To use the mens' expression - "We sometimes get a green bed on top of the Pinneys, in the ceiling, but architects don't like it". It is not much worked.

Compressed air drills. The method of working here is very different to any of the preceding quarries. The stone is got out by compressed air drills. There is an engine at entrance of quarry which does the compressing and the air is then sent along pipes and utilised at the various headings...

... [a] deep horizontal channel cut out by the rock drills along the bedding between a and b [referring to an annexed sketch of the working face, a and b being the hard and soft Pinney beds... the upper layer was then broken off vertically at the back by driving in a line of wedges above it...]

Sawing. The stone is sawn above ground with water and gravel [? sand]. The stone is drawn by the stationary steam engine, before referred to, to the mouth of the quarry which is below the surface of the ground, and then raised to surface...

[A sketch of the arrangements of the quarry entrance is appended, followed by a sketch-plan of the 'Chilmark Ravine' identifying and locating Levi Bowles' quarry, Chilmark quarry, Chilmark (No. 2) quarry, and Teffont quarry, of which last it is reported that it was worked by T.P. Lilly 'who here employs 4 men. At present it is an open working, but they are just beginning to go underground...]

Further details are given, including sketches of the tools used in the Chilmark-Teffont quarries.

Godstone, 27 July 1893

During 1893 visited (on 27 July) 'Godstone Hill Quarry, owned by Sir W. Clayton, worked by Mrs Brotherton, manager Mr Robt Steer. Fourteen men are employed, and there are 50 "rooms" or workings, 13' 6" in width each. Pillars 8'/- by 12'/- & 8 feet between each lengthwise... There seemed to be a definite mode of working this quarry by measurement of both pillars or rooms...

The firestone is in great request for beds in glassmaking factories - especially in the north of England. I saw a large substantial block in the quarry, destined for some place in Lancashire...'

A sketch, a section, and details of tools used are appended.

Sources of Quarry History continued

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AN EIGHTEENTH CENTURY GROTTO: SCOTTS GROTTO, WARE (Hertfordshire)

by David Perman, General Secretary to The Ware Society

Shortened version of a talk given to Subterranea Britannica
October Day Conference at Lucy Cavendish College, Cambridge,
15th October 1983

Ware in the 18th century was a fairly important town in the national life of Britain and had special links with London, and therefore with the literary society of London. First it was the premier malting town in England. Because of its position near to the head of the River Lea Navigation and within easy journey of the best barley-growing country in England, Ware had become from the 17th century the main place where barley was turned into malt and transported down river to the brewers of London. Its importance as a malting centre grew throughout the 18th century and, indeed, one dispute between the Ware maltsters and the excise officers had to be referred to the Prime Minister, Pitt, who wisely decided in favour of the Ware maltsters. It was not until the 1830s that the malting trade changed when the railways opened up Burton-on-Trent as a national brewing centre and, in order to compete, malting in Ware had to become more industrialised.

Samuel Scott, father of John Scott, the maker of the grotto, was a maltster. Originally a London draper, he fled the capital in 1740 with his two sons after his wife and other children had been struck down by disease. It is said that he prospered as a Ware maltster which he would have done as a Quaker, for the Society of Friends were not only hardworking and good at business, but also very prominent in the Ware malting industry and in London brewing. Another connection between the trade and Scotts' Grotto is via Dr Johnson, who is said to have admired John Scott's garden and grotto and pronounced it a "Fairy Hall". In 1774, the year after the grotto appears to have been finished, we hear of Dr Johnson writing to Scott to ask if he might bring his friends Mr and Mrs Thrale to visit the grotto. "They purpose to visit your Dryads and Fairies on Tuesday the thirty first of May, if it will not be inconvenient to You, to receive them at that time".

But the busy working town of Ware had its fashionable side too, exemplified in the riverside gazebos which at one time crowded along the north bank of the Lea at Ware. They were built at the ends of the gardens of the High Street properties at Ware, as far as possible away from the rumble and dirt of the malting wagons and the coaches. There were some 25 of these riverside gazebos at one time - where the owners and their guests could see and be seen by people strolling on the opposite bank. Eight of the riverside gazebos still exist and are now being restored due to an initiative by the Ware Society.

After malting, 18th century Ware was important as a coaching stop and it also provided clean air and clean water for visitors from London.

The house in which Samuel Scott lived with his two sons, Samuel born in 1719 and John, the poet, born 11 years later in 1730, was Amwell House, now part of Ware College of Education. John inherited the house on his father's death in 1770. Scott constructed a number of summer houses, or gazebos, in the garden, two of which survive. One of them, immediately above the entrance to the grotto, is said to have been the poet's favourite retreat, where he wrote the poem "Amwell". A round pen-and-wash drawing, now in the possession of Sir John Hanbury (the last private owner of Scott's Grotto), shows the poet beside this gazebo with his wife, Mary de Horne, and their young daughter, Maria de Horne Scott. Another picture of the entrance to the grotto is shown in an early 19th century print, which describes the grotto as "esteemed one of the greatest curiosities in the county" and says it was designed and constructed about the year 1765. The print also refers to the letter to a friend, the poet-translator John Hoole, in which Scott described his own part in the construction of the grotto. "In making the excavation under the hill, for the subterraneous passage, he marched first, like a pioneer, with his pick-axe in his hand, to encourage his rustic assistants". As may be seen from the print, the grotto was constructed under a tree-covered hill and there has been some speculation that the site may originally have been an old chalk pit. As can be seen from both the print and the pen-and-wash drawing, the grotto had a stretch of lawn before it, but this has now gone because of the construction of Scott's Road, some 15 feet in front and above the original grotto entrance.

The best and, in fact, the only proper plan of Scott's Grotto was drawn in 1899 by R.T. Andrews, a member of the Council of the newly-formed East Hertfordshire Archaeological Society (see Bull. Subterranea Britannica No 17), which visited the grotto on its first excursion on 31st May 1899 (125 years to the day after the visit of Dr Johnson and Mr and Mrs Thrale). Andrews published his plan and scholarly study of the grotto in the Transactions of the East Hertfordshire Archaeological Society in 1901. From this it can be seen that, originally, the grotto had seven chambers, linked by passages and/or ventilation and lighting shafts. Andrews gives a very full discussion of some of the puzzles and mysteries concerning the grotto, including the traditions that the grotto cost £10,000 to construct and took 30 years. Andrews concluded that both these figures should be halved. He also discussed the tradition that the grotto was begun in 1734, which would have made it four years after John Scott's birth and six years before Samuel Scott senior moved his family from London. Andrews is inclined to think that the grotto was begun in the 1750s, possibly by Samuel Scott senior. Others, including John Scott's American biographer, Lawrence D. Stewart (John Scott of Amwell, (1956) University of California Press) found clues to the beginning of the grotto in the poet's writing. In an elegy, written in July 1757, he complained of the heat:

> O for some secret shady cool recess,
> Some Gothic dome o'erhung with darksome trees,
> Where thick damp walls this raging heat repress,
> Where the long aisle invites the lazy breeze!

Dr Johnson pronounced Scott's Grotto to be a "Fairy Hall", he said that "none but a poet could have made such a garden", which may have been intended as a sort of back-handed, ambiguous comment.

From R.T. Andrews' plan and description of the grotto, we see that in front of the excavations there was a vestibule and porch, one of the seven chambers mentioned by Mr Andrews. His description of these rooms is as follows: "the porch has an entrance doorway and two window openings of small dimensions, and is but 2 feet 9 inches (85 cm) in depth, with walls 16 inches (40 cm) thick; the ceiling follows the line of the roof; it and the walls are ornamented with white and black flints and shells, especially round the edges of the openings. From this porch, the visitor passes into the vestibule or antechamber, 8 feet 6 inches (2.6 m) long by 6 feet 6 inches (2.0 m) wide, lighted by two windows on either side, and having a niche in each angle; the ceiling of this chamber is arched and groined to its centre, and the whole is exquisitely decora-

ted in its four panels with other panels, and together with the walls has no blank spaces left that are not covered with shells, etc; whilst the floor is paved with small regular black pebbles formed into a pattern by wooden ribs". R.T. Andrews' description is worth giving in full because, alas, the porch and vestibule of Scott's Grotto are no more. When the last private owner vacated the property in 1966 and the surrounding land was developed for modern housing, a rather terrible dilapidation took place, mainly it is thought because of vandalism. In about 1973, the newly formed East Hertfordshire District Council undertook responsibility to repair the structure and, in their restoration work, the porch and vestibule were completely demolished. The present entrance to the grotto, therefore, bears no relation to the old prints and paintings, but simply shows the four underground entrances.

Of the four existing entrances, the second from the left, or the centre one of the three which originally opened into the vestibule, leads into a chamber which R.T. Andrews named the "Consultation Room". Incidentally, the names used to describe the chambers appear to be Andrews' names; other names had been used previously as will be mentioned. Andrews said that the chamber was ornamented with shells though without a pattern, and the floor was paved with flints. It is difficult to see these now as the chamber is piled high with broken flints. At the rear, a circular ventilation shaft goes to the Committee Room and beyond that to the Robing Room. The right-hand doorway goes nowhere at all, and may have been a discontinued excavation of further chambers and passages.

It is through the left-hand doorway that one must pass if one is to enter the grotto proper. The passage immediately goes down a number of steps, passing niches to right and left. Ahead is a Gothic arch and beyond that another arched ventilation shaft. Just before the arch, the passage turns through an angle of 120° and continues on and downwards to a crossing. Beyond the crossing is the square chamber which Andrews called "Committee Room No 2", with flint walls, three niches and some shell decoration. Back at the crossing, we turn back to the Refreshments Room, which is less decorated. A ventilation shaft from the outside connects these two chambers. From the Refreshments Room, we pass again over the crossing, from where the passage becomes undecorated: Andrews described it as plastered, today it is rendered in cement. Further on there is another passage to the left and turning through an obtuse angle is the Committee Room. This chamber is at the very centre of the grotto, it has three niches but no other entrance. The decoration is fairly rudimentary. Turning back to the passage which was passed, making a circuit, passing a niche on the left and then entering the so-called Robing Room. This has changed a lot, much of the decoration of the walls has been lost, since Andrews describes it as being "covered in every part with one kind of shell, and the walls with shells and black stones in wavy lines, are roughly panelled, and with a large shell in almost every panel". More serious is the disappearance of the central pillar and groin ribs up to the dome. This is the farthest point of the grotto, 67 feet (20.4 m) from the entrance and 34 feet (10.4 m) below the hill. Beyond the Robing Room the plain passage turns through another bend of approximately 120°, with two niches. From then on it is lined with flints and at last enters the grandest chamber of all, which Andrews called the Council Chamber. This has two entrances, six niches which form seats, and a dome. The shell decoration of the niches is very elaborate indeed and much of it still survives. The original dome has disappeared and been replaced by a modern wooden and copper dome. The other entrance of the Council Chamber leads up steps to ground level.

Up the hill, now very overgrown indeed, above the dome of the Council Chamber is Scott's study, the gazebo, where he is reputed to have written his poem, "Amwell". It is today in an advanced state of dereliction, but can be seen to have been constructed in a similar style and with similar materials to the grotto beneath.

Which brings us to the question of why John Scott constructed this grotto. Some motives can be ruled out immediately. One of them is that it has something to do with Freemasons, but there is no evidence of that and indeed no evidence of Freemasons in the vicinity of Ware until 1829 when the Hertford Lodge was formed. It seems most likely that Scott knew of Pope's Grotto at Twickenham - he may even have visited it

after Pope's death - and that he succumbed to the prevailing fashion of the 18th century for grotto-building. But Scott's Grotto is rather different from all the others. All of the so-called grottos built before Pope's and many of the later ones were either basement rooms in houses, often decorated with shells, or else they were structures partly above ground, incorporating fountains or rills and statues in the Roman manner. It can now confidently be said that the Shell Grotto at Margate was not constructed before the early 1800s and has no ancient connections with Druids, Phoenicians or Cretans or anything like that. Pope's Grotto at Twickenham fulfilled a very practical purpose, that of joining together the two parts of his property separated by a road. Scott's Grotto has no apparent similar practical purpose, although it may not be a coincidence that John Scott was interested in road-building both in Ware and in constructing the new highway from Ware to Hertford and may well have employed some of the highway labourers on a little spare-time grotto construction. Added to that is the fact that Scott was a poet, but also a practical man, who was clearly affected by the typically 18th century passion for creating the landscapes about which he wrote. It was a matter of art creating nature and nature recreating art, as in his description of the grotto in his poem "The Garden":

> Where midst thick oaks the subterranean way
> To the arched Grot admits a feeble ray,
> Where glossy pebbles pave the varied floors,
> And rough flint walls are decked with shells and ores,
> And silvery pearls, spread o'er the roof on high,
> Glimmer like faint stars in a twilight sky.
> From noon's fierce glare, perhaps he pleased retires,
> Indulging musings which the place inspires;
> Now where the airy octagon ascends,
> Midst evening calm, intent perhaps he stands,
> And looks o'er all that length of sungilt lands,
> Of bright, green pastures stretched by rivers clear
> And willow groves or osier island near."

A further, semi-practical motive for grotto construction was that Scott, a would-be literary figure, was exiled from London by his own and his family's fear of disease. But, in the 18th century, a grotto was a great tourist attraction, as the signatories in Scott's own visitors' book show. Later on, after his death and the splitting up of his estate, a more concerted effort was made to attract visitors. And even today, when Scott's Grotto is virtually unpublicised, it still has the power to attract visitors.

But, finally, the writer thinks one has to look for the purpose of this grotto in Scott's own personality. As well as the refinement and taste for which he was renowned, there was a morbid, melancholy streak in John Scott's character and perhaps it is this which accounts for the special character of Scott's Grotto. In her very comprehensive book, Follies and Grottos (1974), Constable, Barbara Jones puts Scott's Grotto in the later tradition of the tunnellers who made "dark and badgery grottoes". "At Ware", writes Barbara Jones, "John Scott built himself a grotto which marks the transition from the airy lightness of the great patrician extravagances to the true morbidity of the less patrician labyrinth builders".